1 1) A method of filtering data prior to reading a digital watermark that was inserted
2   using a scale to black technique, said method comprising the steps of first
3   projecting the color values of each pixel onto a preferred projection axis that is
4   determined by examining the color of the surrounding pixels, and by reading the
5   watermark from the resulting data.
6
7 2) A system for reading a digital watermark from a digital image which consists of a
8   number of pixels, each pixel being defined by a set of numbers representing the
9   color components of the particular pixel, a filter for calculating the value of each
10   pixel along a preferred projection axis, and a watermark reader which operates
11   on the values calculated by the filter.
12
13 3) A method of calculating values that will be used to read a watermark from a
14   digital image comprising the steps of: projecting the color values of each
15   particular pixel to a preferred projection axis, said preferred projection axis being
16   determined by averaging the colors of the pixels in an area surrounding said
17   particular pixel.
18
19 4) The method recited in claim 1 wherein the pixels in an area of three by three
20   pixels is examined to determine the preferred projection axis.
21
22 5) The method recited in claim 1 wherein said watermark has a particular tile size
23   and wherein said the pixels in an area the size of said tile are examined to
24   determine the preferred projection axis.
25
26 6) The system recited in claim 2 wherein said filter examines the pixels in an area
27   of three by three pixels to determine the preferred projection axis.
28

1   7) The system recited in claim 2 wherein said watermark has a particular tile size

2   and wherein said filter examines the pixels in an area the size of said tile to

3   determine the preferred projection axis.

4

5   8) The method recited in claim 3 wherein the pixels in an area of three by three

6   pixels is examined to determine the preferred projection axis.

7

8   9) The method recited in claim 3 wherein said watermark has a particular tile size

9   and wherein said the pixels in an area the size of said tile are examined to

10   determine the preferred projection axis.

11

12   10) A system for filtering data prior to reading a watermark by first projecting the

13   color values of each pixel onto a preferred projection axis that is determined by

14   examining the color of the surrounding pixels, and by reading the watermark

15   from the resulting data.

16

17   11) A system for reading a digital watermark in a image that consists of a number of

18   pixels each represented by a set of numbers representing different colors, said

19   system comprising,

20   a filter which projects the set of numbers representing each pixel onto a preferred

21   projection axis by averaging the values of said pixels of a particular area, and

22   a watermark reading program for reading said watermark from said preferred

23   projection axis.

24

25   12) A system for reading a digital watermark from a colored image that consists of

26   a number of pixels each having multiple color components, said system comprising,

27   means for filtering said digital image to project the colors components of each pixel

28   to a preferred projection axis, and

29   means for reading said watermark from said filtered image.

30

1   13) A method of reading a digital watermark from a colored image that consists of

2   a plurality of pixels and which was watermarked using a scale to black

3   watermarking technique, said method comprising the steps of

4   first filtering said colored image to generate filtered data by projecting the color

5   values of each pixel onto a selected axis that is determined by examining the color

6   of the surrounding pixels, and

7   reading the watermark from the resulting filtered data.

8

9   14) A method of reading a digital watermark from a digital colored mage that

10   consists of a number of pixels, each pixel being defined by a set of numbers

11   representing the color components of the particular pixel,

12   filtering the value of the set of numbers that represents each pixel by projecting said

13   values to a selected axis, the direction of said selected axis being determined by

14   examining the values of the pixels in an area surrounding said pixel, and reading

15   said watermark from the values calculated by the filter.

16

17   15) The method recited in claim 14 wherein said filter determines the direction of

18   said selected axis for each pixel by examining the values of the pixels in a three by

19   three area surrounding said pixel.

20

21   16) A watermark reading method for reading a watermark that has been inserted

22   into the luminance value of the pixels of an image by projecting color changes

23   needed to embed said watermark onto the luminance axis of each pixel by

24   projecting from an axis from black to the color of the pixel, said method comprising

25   filtering said image prior to reading said watermark by first projecting the color

26   values of each pixel onto a preferred projection axis that is determined by

27   examining the color of the surrounding pixels, and by reading the watermark from

28   the resulting data.

29

1   17) A method of inserting first and second watermarks in an image comprising,

2   inserting said first watermarks in said image in a first color direction and inserting

3   said second watermark in a color direction orthogonal to the color direction of said

4   first watermark.

5

6   18) A method of reading two orthogonally inserted watermarks from an image by

7   first filtering said image to project each pixel onto a preferred projection axis

8   determined by the average color of the surrounding pixels and reading said first

9   watermark from the resulting data, and then projecting each pixel onto an axis

10   orthogonal to said preferred projection axis and reading the second watermark from

11   the resulting data.

12

13   19) The method recited in claim 17 wherein the intensity of said second watermark

14   is lower than the intensity of said first watermark.

15

16   20) A method of filtering an image containing a digital watermark to generate a set

17   of values from which said digital watermark can be read, said digital watermark

18   having been inserted along a particular color axis, said method comprising

19   projecting the color values of each pixel onto a color axis which approximates the

20   color axis used to embed said watermark in said pixel.

21